



THE PRAIRIES OF MANITOBA.

By A. T. DRUMMOND.

In August of this year, another opportunity occurred to me of examining the superficial deposits around Portage la Prairie, Birtle and Kinbrae—the last named place about thirty miles north-west of Fort Ellice. The resulting facts will prove of interest in connection with questions that have been discussed about the origin of the north-west prairies.

At Portage la Prairie the country is on all sides flat, and bears evidence of two to three periods of growth and decay of grasses and reeds in shallow water, alternating with periods of subsidence of the land. The general surface is perhaps twelve feet above the Assiniboine River, and that stream is in turn about the same number of feet higher than Lake Manitoba, which lies only fourteen miles to the northward. The banks of the river, in a height of twelve feet, show three layers of black loam, each from six to twelve inches or more in thickness, alternating with a creamy gray clay, and the whole underlaid near the water's edge by a reddish clay. Boulders throughout this section of the country and eastward to Winnipeg are unseen, even in the bed of the river at low water. Towards Westbourne, the large tract of low land, usually covered with water, and lying between Rat Creek and the Westbourne marsh proper, and through which the Manitoba and Northwestern Rail-

way's track is built, was perfectly dry. That this was an exceptionally dry year, was shown by the enormous numbers of dead shells of *Limnæa*, *Planorbis*, *Physa* and other genera, which, everywhere, rendered the ground crisp under the tread of the foot. The ground was covered by a heavy growth of grasses of three or four species, scattered everywhere in great patches, each grass occupying its own patches to the exclusion of the other grasses. The soil is a heavy black loam, and the surrounding circumstances all clearly show how such soils have been formed in the valleys of the Lower Assiniboine and of the Red River, and around Lake Manitoba, by the annual decay of such marsh grasses.

To the westward of the Big Grass Marsh and the Westbourne Marsh, circumstances are changed. The country, after leaving the gravel ridges which strike the line of the Manitoba and Northwestern Railway at Arden, becomes of a slightly rolling character, and increasingly so some distance farther westward. As Neepawa is approached, the surface loam is underlaid by sand. Boulders become exposed in the river valley at Minnedosa and in the side valleys leading into it—washed out, no doubt, from the drift clays which at a greater or less depth underlie the surface soil. At Birtle, the Laurentian boulders are not only common in the deep valleys, especially on the eastern side, of the Bird Tail and of Snake Creek,—appearing in almost a solid mass of both large and small boulders at one point at the creek level near Birtle—but are also on the surface of the prairie above. They are in the latter case, generally more common in and upon the surface of the low ridges which here and there somewhat parallel each other. Proceeding still westward, boulders are not frequent in the valley of the Assiniboine River at Fort Ellice and at the railway crossing eighteen miles up the stream, but the bed of the river at the ford is formed entirely of very large sized gravel. Nor do boulders appear again until the country beyond Langenburg is reached. Here there are two or three gravelly knolls rising twenty-five or thirty feet above the general level, like the Spy Hills, also gravelly knolls,

nearer Fort Ellice. In the vicinity of Kinbrae, the surface soil is a sandy loam with ridges of loam mixed with gravel. A well sunk here on George B. Fisher's farm, gave a section showing in descending order, one foot of sandy loam, eleven feet of clay, with a few rounded boulders in it, and thirty feet of sand, which grew coarser towards the bottom. At Langenburg, another well gave, before the sand was reached, one hundred and sixty feet of wet sticky clay, holding boulders. There was considerable difficulty in securing water at this latter place until this depth was reached. At neither place was there any appearance of layers of black loam as at Portage la Prairie and Winnipeg. The boulders here and at Birtle are relatively small, seldom exceeding two feet across, and, with the gravel, have rather the worn appearance resulting from the action of ice than the rounded look which the water on a sea or lake coast would give them. Both boulders and gravel in the neighborhood of Kinbrae are Laurentian, intermixed with some of a limestone which weathers a buff in colour. One of these larger limestone boulders was heavily striated and was, otherwise, worn smooth to the condition of a slab. Nearly all of the sloughs were dry, as a result of the drought this year, and some were, like the dry marshes near Westbourne already alluded to, dotted with the dead shells of *Limnæa* and other fresh water mollusks.

CONCLUSIONS.

The conclusions I have formed are, that the Manitoba prairies east of the Pembina and Riding mountains are the most recently formed, and are still undergoing a process of extension in the great marshes still existing and on the shallow lake margins, through the annual growth and decay of the luxuriant grasses growing there. There had been two or three depressions of the land in the course of the formation of these prairies, during each of which, deposits of sediment, carried down by the muddy northern and western rivers, were made over the loam formed by such decaying grasses, giving thus the alternate loam and clay now observable. There is no evidence to show that

during these depressions the subsidence was sufficient for, or the other surrounding conditions favourable to, the action or even the existence of icebergs, though previous to this time, this section of the Northwest was no doubt also subject to the action of ice, all evidence being now covered up by the more recent deposits here referred to.

West of these lower and more recently formed prairies, are the rolling prairies, which have an origin somewhat different. The stretches of sand, both on the surface and under the clays, point to the existence of extended lake and sea margins at more than one period. The extensive, somewhat parallel gravel ridges at Arden, the gravel knolls, the smaller ridges with boulders in and on them at Birtle and west of Langenburg, and the uneven, rolling nature of the surface of the prairie, all seem to me to point to the action of icebergs in the glacial or post-glacial seas, modified afterwards by the water during subsidence, and to indicate the direction of the force, whether wind or current or glacier, which at these places impelled the bergs onward. Further, the thinner surface loam, mixed to the westward with some sand, would seem to point to a condition of growth and decay of plant life, less defined than and probably of a different character from that on the lower prairies to the eastward.

The Assiniboine, though presently a branch of the Red River, was not always so, and is in its upper reaches above Brandon, a much older river. When the whole prairie east of the Riding and Pembina Mountains was a vast shallow lake, the Assiniboine was a large stream varying from half a mile to a mile and more in width for most of its course, discharging into this lake the surplus waters of the country to the northward and westward. As the whole surface of the continent here, to the east and west, but more especially to the westward, continued to rise, in the long lapse of time, the Assiniboine, with the strongly increased current which its relatively higher level westward gave it, cut its way through the surface soils to its present great depth of about two hundred feet below the prairie level.





As the land eastward of Brandon rose above the water level, the river had of necessity to form a continuation of its course to some new outlet for its waters. This new outlet was eventually found at Winnipeg, where it joined the Red River, which must then have been a new stream, formed by the waters of the south, seeking, by reason of the rise of the land there, a new exit to the sea to the northward. That the Assiniboine had by this time become a small stream compared with its former proportions, is shown by the contracted banks of this newer part of its course, those at Winnipeg and Portage la Prairie being not more than from two to three hundred feet apart, and from twelve to fifteen feet high.